Module 7: Effect of Agile on Post-Contract Award

Module TLO: Given a DoD program involved in software development using an Agile approach, the student will identify key post-contract award activities for effective program analysis and oversight.

ELOs

1. Recognize the changes in documentation delivery in an Agile environment.
2. Identify changes to the role of government agencies/oversight in programs using an Agile approach.
3. Recognize the level of involvement required of stakeholders for an Agile approach to be effective.
4. Recognize the parallels between Agile and traditional EVM methodologies.
5. Identify how progress is measured at the team and program levels in an Agile environment.

Assessment

LP - Be careful what you ask for when receiving and reviewing CDRLs as multiple Levels of abstraction will exist in same package (ELO 1)

MT-Government oversight requires modification in an Agile environment. (ELO 2)

LP-Different acquisition contexts (e.g. ACAT 1 vs non-ACAT) have different oversight implications with Agile (ELO 2)

MT-Multiple oversight authorities (service and DoD level) are engaged in understanding how to effectively oversee Agile environments. (ELO 2)

LP - Stakeholder involvement increases in an Agile environment due to the rapid cycle of incremental planning, development, and review (ELO 3)

MT - Government's role in product management (and incremental acceptance of the product) is critical to success (ELO 3)

LP - Agile enables situational awareness across stakeholders and provide the ability to accurately measure and forecast performance (ELO 4,5)

MT - Stakeholders should be aware of the impacts of technical debt and the migration of work in an Agile environment (ELO 4,5)

MT - Objective technical completion criteria are essential for evaluating progress and performance regardless of the level at which the measurement occurs (ELO 5)

Module 7: Effect of Agile on Post-Contract Award-continued

Module TLO: Given a DoD program involved in software development using an Agile approach, the student will identify key post-contract award activities for effective program analysis and oversight.

Assessment (Rework with final list)

LP - Be careful what you ask for when receiving and reviewing CDRLs as multiple Levels of abstraction will exist in same package (ELO 1)

MT-Government oversight requires modification in an Agile environment. (ELO 2)

LP-Different acquisition contexts (e.g. ACAT 1 vs non-ACAT) have different oversight implications with Agile (ELO 2)

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Module Story

What story do we want to tell as motivation and to support terminal learning objective

Module Contents

1. Documentation (ELO 1)
2. Regulatory oversight (ELO 2)
3. IBR (ELO 2)
4. Participating in Agile reviews (ELO 3) note – add something about people who cross multiple projects agile/not
5. Performance Measurement (ELO 4, 5)

Subtopic 1: Documentation

- Understanding the cadence of documentation development may increase in an Agile environment.
  - Incremental delivery of documentation
    - Just enough for a particular iteration or release
- CDRLs – be careful what you ask for
  - Projective (to be) vs As-Built documentation
    - Too much detail in requirements documentation before implementation starts (the traditional approach) doesn’t allow for the learning that inevitably occurs when software is implemented
    - Because implementation occurs much earlier in Agile settings, it is more productive to allow the later requirements documentation to be at a higher level of abstraction, so refinements based on the learning from implementation don’t require Engineering Change Proposals and other baseline change mechanisms to be accommodated
- US Navy has a CDRL guide for Agile programs

Subtopic 1: Documentation (continued)

- LP - Be careful what you ask for when receiving and reviewing CDRLs as multiple Levels of abstraction will exist in same package (ELO 1)
  - True/False: CDRL documentation frequency is always the same with Agile settings as with traditional settings (False).
  - Multiple Choice: In comparison to traditional settings, documentation in Agile settings can be expected to be:
    - More “to be” than “as built”
    - “to be” and “as built” is equal
    - More “as built” than “to be” (correct)

Suggested Content

Appropriate is Context-dependent. Docs needed in almost any DoD context:

- User documentation
- Installation/deployment documentation
- Sustainment documentation
  - As built requirements
  - As built architecture and design
  - As built data schema

Documentation used to support decision making throughout the acquisition process varies more in Agile settings

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Two Major Types of Documentation

PROJECTIVE documentation (documentation that projects how the system will behave or what it will do) is generally seen as less valuable in Agile settings

- Build-to detailed design specification
- Detailed software requirement specifications
- …(the word specification is a clue that the document is projecting what is expected, not documenting what exists)

AS-IS documentation (documentation that describes the completed system or functions for a particular stakeholder group) is usually still needed

- Maintenance manual for sustainment programmers
- Database schema for DBAs
- User manual for end users
- Install manual for deployers
- Configuration listing for IT operations staff

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Alternatives for Producing Documentation

Tailored documentation requirements; what is provided is produced incrementally with the code

SETA contractor hired by the program office to review the repository of development information (embedded in a tool that supported Agile methods) and produce required documentation from it.

Technical writers embedded with the Agile team produced documentation in parallel with the development activities.

Contractor personnel doing program controls activities produced required documentation toward the end of each release. The contractor program control personnel took the outputs from the Agile process and formatted them to meet the 5000 required documents.

If particular documentation produces no value for particular program – then seek waivers

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Subtopic 2: Regulatory oversight

- Understanding the role of government agencies/oversight in Agile programs.
  - Direction of DCMA, PARCA, AT&L, services etc., Test, Business Systems
  - Service Acquisition Executives
- All these organizations have efforts focused on agile
  - Describe various efforts
  - Links to efforts
- Mindful tailoring (Kendall presentation, 2015 DOD 5000)?
- Different acquisition contexts (e.g. ACAT 1 vs non-ACAT) have different oversight implications with Agile

Subtopic 2: Regulatory oversight (continued)

- Index of Major Takeaways/Assessment Suggestions

- MT - Government oversight requires modification in an Agile environment (ELO 2)
  - The reviews that are common in Agile settings that are not called out in DoD 5000.02 include:
    - iteration/sprint review or demo
    - release review
    - iteration/sprint retrospective
    - all of the above (correct)
    - none of the above
- LP - Different acquisition contexts (e.g. ACAT 1 vs non-ACAT) have different oversight implications with Agile (ELO 2)
  - True/Fales: If using an Agile approach on an ACAT 1 program, you don't have to accommodate Preliminary or Critical Design Reviews. (False)
- MT - Multiple oversight authorities (service and DoD level) are engaged in understanding how to effectively oversee Agile environments. (ELO 2)
  - Multiple choice: The following organization has released a report on best practices and lessons learned from early Agile implementations in government settings:
    - OSD
    - Dept of Commerce
    - GAO (correct)
    - DIA

Insight and Oversight…

There is a great deal of OVERSIGHT activity that is required by the acquisition system to progress a program, software or otherwise

- Many of the mechanisms used for acquisition oversight could be seen as substitutes for the communication that naturally occurs in a trust-based relationship
- Regardless of the informal communication on the program, required oversight has to be accomplished

The other goal for contract monitoring is to achieve INSIGHT into the program

- Acquisition CDRLS and required events are not always the best way to achieve insight
- Agile development settings, in particular, promote transparency and have built in mechanisms for achieving ongoing insight
  - These mechanisms, however, require proactive participation from the acquirer to be effective

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Releases Prior to Engineering Release—Agile Considerations

When contractor is using Agile methods, one of their risk mitigation approaches is to provide multiple internal releases of working software to program stakeholders

- So that stakeholder feedback can provide course corrections as the implementation progresses
- To incrementally provide value

Agile releases are typically made up of 3-6 short iterations (2-4 weeks)

- In non-agile formats, these types of reviews should occur informally (TIMs and other types of notifications)

A Release Review, in addition to iteration/sprint reviews, are opportunities for the Program Office to interact directly with the software as it progresses

- Make them more useful by building relationships with IA, OT&E, and other certification authorities that encourage them to work early with internal releases in building their own activities and providing early feedback and course corrections to the acquisition team

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Subtopic 3: IBR (Integrated Baseline Review)

- A capability-based WBS is frequently used in an Agile environment.
  - In some settings, the Agile part of the acquisition still must align with a component-based WBS
    - Problems and pitfalls to be aware of
- Address tie-ins to technical review/acquisition milestone cycles
- Be aware of best practices in execution of control accounts
  - Too much detail can burden the program
- The stakeholders for Agile go way beyond the immediate pgrm
  - Cyber, EVM, Finance, OT, deployment, etc

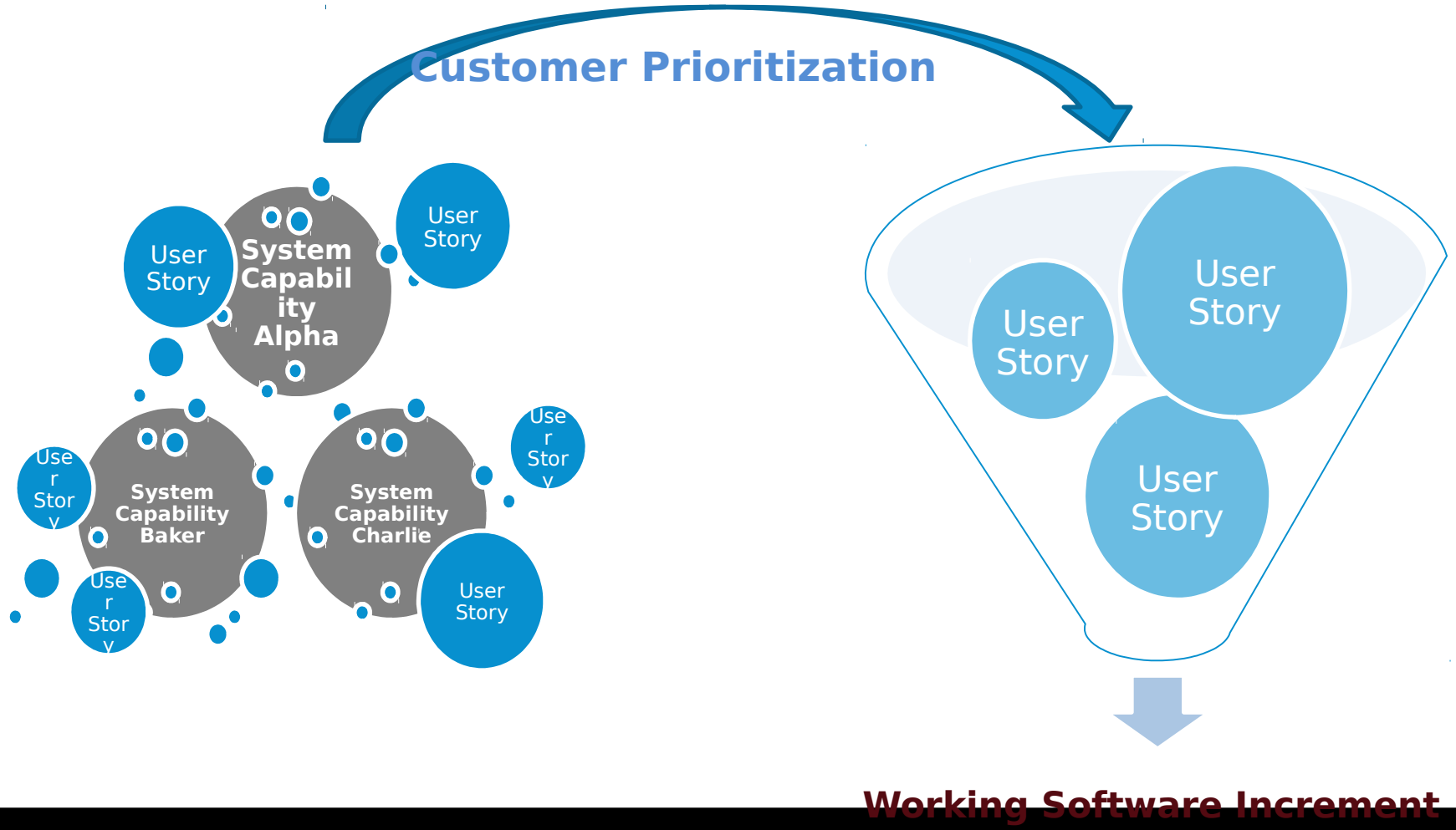
Subtopic 3: IBR (Integrated Baseline Review)-continued

- Index of Major Takeaways/Assessment Suggestions
- MT - Government's role in product management (and incremental acceptance of the product) is critical to success (ELO 3)
  - Which Agile Manifesto tenet(s) reflect(s) the need for government to be actively involved in product management and incremental acceptance to assure success?
    - a. individuals and interactions valued over processes and tools
    - b. customer collaboration valued over contract negotiation
    - c. working software valued over comprehensive documentation
    - d. responding to change valued over following a plan
    - a. and b.
    - c. and d.
    - all of the above (correct)
- LP-Stakeholders for an Agile IBR go beyond what is typical for traditional acquisition. (ELO 3)
  - Multiple Choice: The following stakeholders could be expected to attend an Integrated Baseline Review (IBR) in an Agile setting:
    - End users or their representatives
    - Operational Test manager or his/her staff
    - Development contractor(s)
    - Cybersecurity specialists
    - All of the above (correct)
    - None of the above

Subtopic 3: IBR (Integrated Baseline Review)-continued 2

- MT-Requirements still must be baselined, but level of detail of baselined requirements may be at a higher level than in a traditional program. (ELO 1)
  - True/False: In an Agile setting, using a higher abstraction level for requirements documentation allows for the incremental learning that occurs with earlier implementation of the code. (True)

Requirements is One Type of Documentation…



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Subtopic 4: Participating in Agile reviews

- Understanding the level of involvement required for Agile processes to be effective.
  - Portfolio Management/Road-mapping
  - Incremental planning
  - Incremental reviews
- Dealing with a mix of traditional and Agile programs
  - Recognize pressure on stakeholders crossing over between traditional and Agile programs

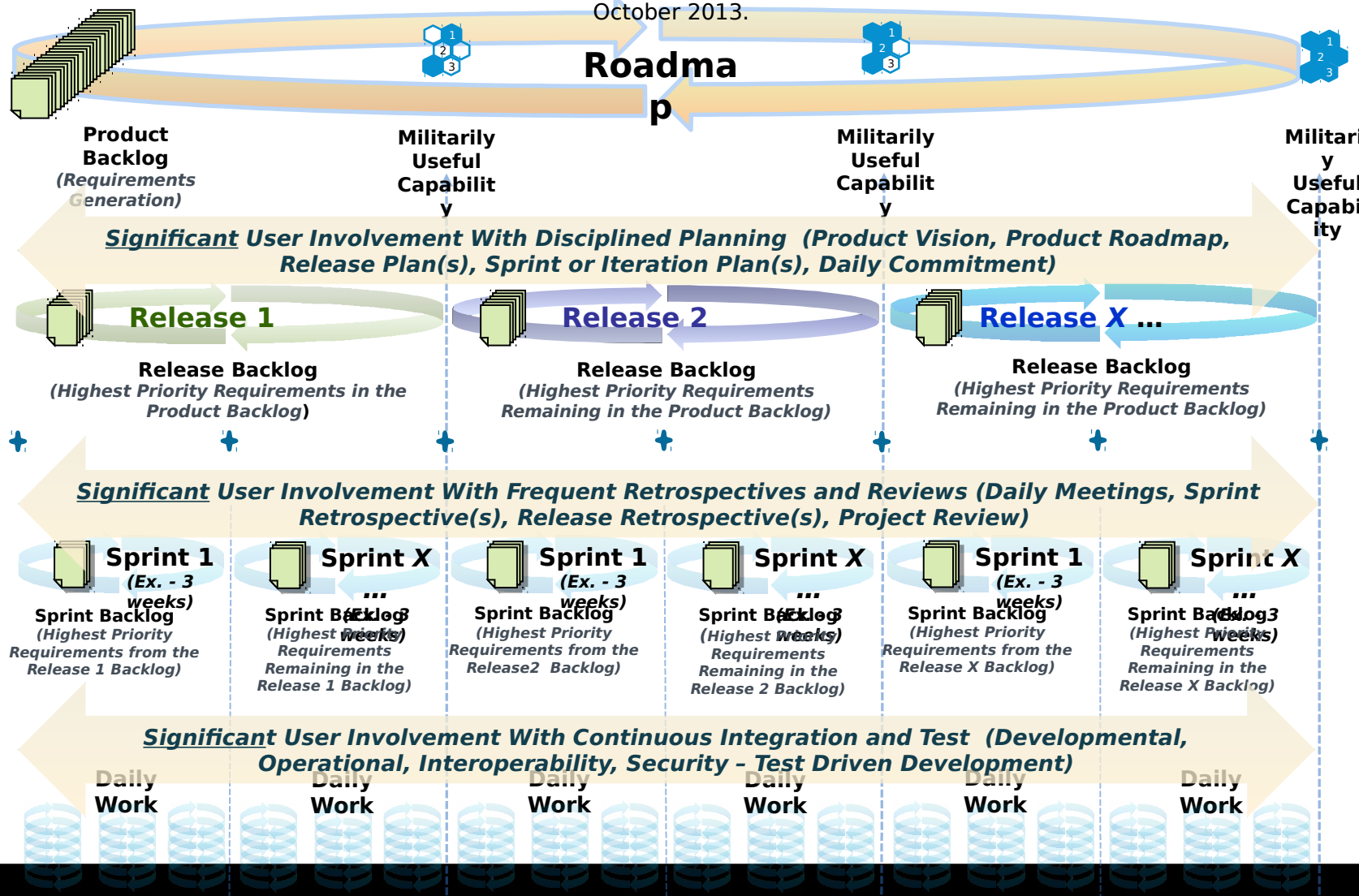
Subtopic 4: Participating in Agile reviews

- Index of Major Takeaways/Assessment Suggestions

- LP - Stakeholder involvement increases in an Agile environment due to the rapid cycle of incremental planning, development, and review (ELO 3)
  - Multiple Choice: Aspects of an Agile environment that contribute to the need for increased stakeholder involvement include (only choose one):
    - the fact that the stakeholders will only get one chance to review their piece of the product (not correct)
    - rapid cycle (2-4 weeks) cycle of incremental planning, development, and review (correct)
    - the increased number of staff that are automatically allocated to an Agile project (not correct)
    - <need one more distractor>
- LP-Level of involvement in Agile activities for program office depends on size and scope of Agile effort (product owner vs product manager in particular) (ELO 2)
  - True/False: Having a government person as a product manager (release level) allows government influence, making it safer to allow lower level decisions (e.g. by a product owner) to be delegated to the contractor. (True)

Suggested Content: Generic Agile “Program” with Multiple Layers

Source: Figure 4, *Parallel Worlds: Differences in Agile and Waterfall Differences & Similarities,* S. Palmquist et al, SEI-2013-TN-021, October 2013.


Roadmap
Product Backlog (Requirements Generation)
Militarily Useful Capability
Militarily Useful Capability
Militarily Useful Capability
Significant User Involvement With Disciplined Planning (Product Vision, Product Roadmap, Release Plan(s), Sprint or Iteration Plan(s), Daily Commitment)
Release 1
Release 2
Release X ...
Release Backlog (Highest Priority Requirements in the Product Backlog)
Release Backlog (Highest Priority Requirements Remaining in the Product Backlog)
Release Backlog (Highest Priority Requirements Remaining in the Product Backlog)
Significant User Involvement With Frequent Retrospectives and Reviews (Daily Meetings, Sprint Retrospective(s), Release Retrospective(s), Project Review)
Sprint 1 (Ex. - 3 weeks)
Sprint X ...
Sprint 1 (Ex. - 3 weeks)
Sprint X ...
Sprint 1 (Ex. - 3 weeks)
Sprint X ...
Sprint Backlog (Highest Priority Requirements from the Release 1 Backlog)
Sprint Backlog (Highest Priority Requirements Remaining in the Release 1 Backlog)
Sprint Backlog (Highest Priority Requirements from the Release2 Backlog)
Sprint Backlog (Highest Priority Requirements Remaining in the Release 2 Backlog)
Sprint Backlog (Highest Priority Requirements from the Release X Backlog)
Sprint Backlog (Highest Priority Requirements Remaining in the Release X Backlog)
Significant User Involvement With Continuous Integration and Test (Developmental, Operational, Interoperability, Security – Test Driven Development)
Daily Work
Daily Work
Daily Work
Daily Work
Daily Work
Daily Work

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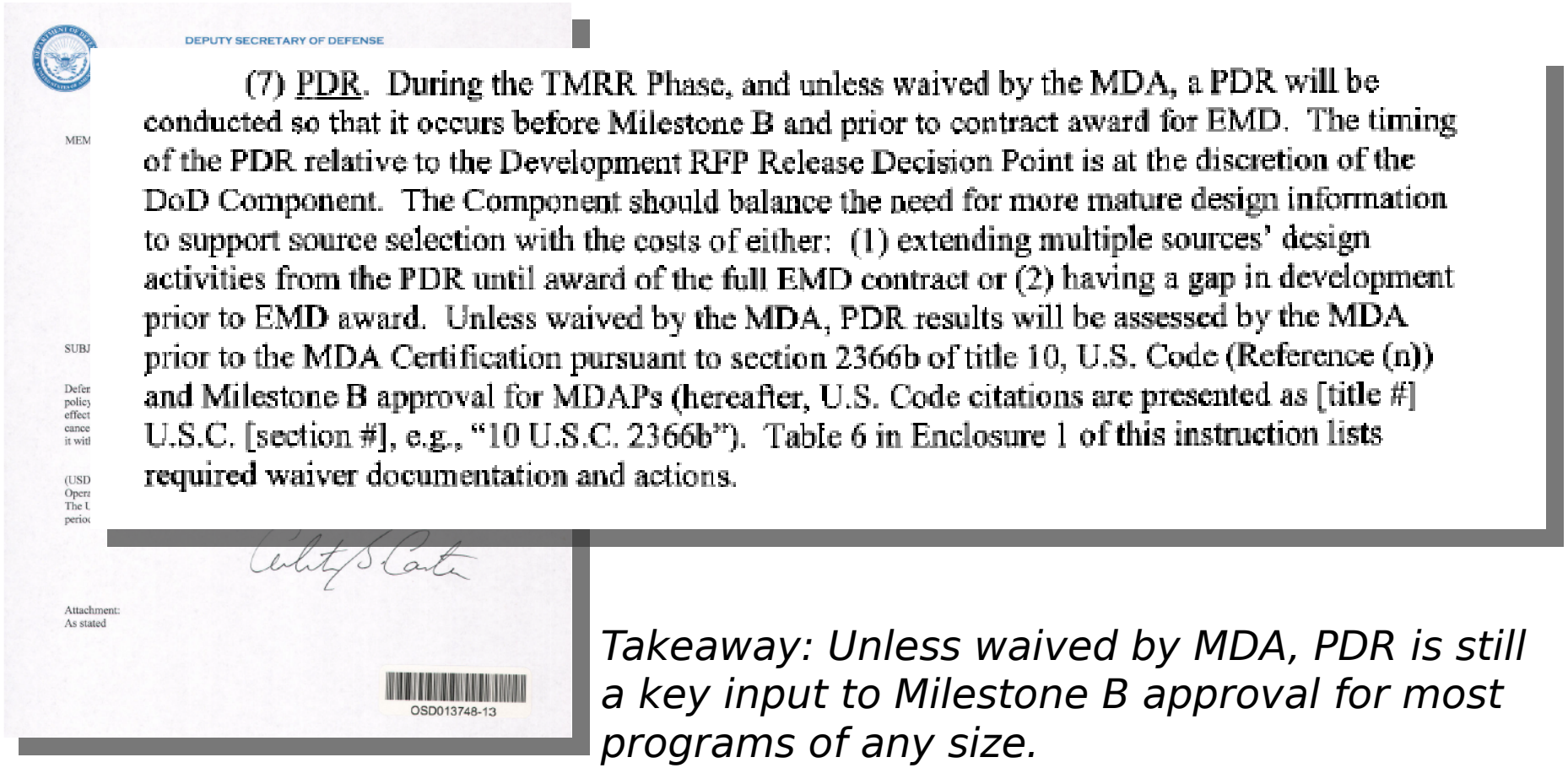
PDR Guidance in DoD 5000.2-1



DEPUTY SECRETARY OF DEFENSE

(7) PDR. During the TMRR Phase, and unless waived by the MDA, a PDR will be conducted so that it occurs before Milestone B and prior to contract award for EMD. The timing of the PDR relative to the Development RFP Release Decision Point is at the discretion of the DoD Component. The Component should balance the need for more mature design information to support source selection with the costs of either: (1) extending multiple sources' design activities from the PDR until award of the full EMD contract or (2) having a gap in development prior to EMD award. Unless waived by the MDA, PDR results will be assessed by the MDA prior to the MDA Certification pursuant to section 2366b of title 10, U.S. Code (Reference (n)) and Milestone B approval for MDAPs (hereafter, U.S. Code citations are presented as [title #] U.S.C. [section #], e.g., "10 U.S.C. 2366b"). Table 6 in Enclosure 1 of this instruction lists required waiver documentation and actions.

Attachment:
As stated

OSD013748-13

Takeaway: Unless waived by MDA, PDR is still a key input to Milestone B approval for most programs of any size.

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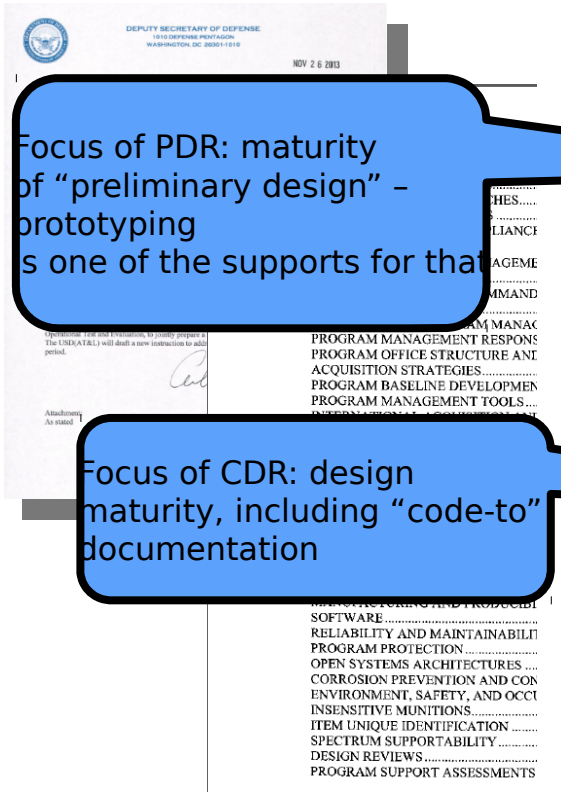
PDR & CDR Guidance in DoD 5000.2-2



Focus of PDR: maturity of "preliminary design" – prototyping is one of the supports for that

PDR establishes allocated baseline

Focus of CDR: design maturity, including "code-to" documentation

CDR establishes initial product baseline

20. DESIGN REVIEWS. Program Managers will plan for and conduct design reviews as needed to manage program planning and execution. Design review planning will be included in the SEP. Any program that is not initiated at Milestone C will include the following design reviews:

a. PDR. The PDR assesses the maturity of the preliminary design supported by the results of requirements trades, prototyping, and critical technology demonstrations. The PDR will establish the allocated baseline and [illegible] to detailed design (development of build-to drawings, s[illegible] fabrication documentation) with acceptable risk. For[illegible] assessment will be conducted and provided to the MDA. For ACAT ID and ACAT IAM programs, DASD(SE) will participate in the program's PDRs as the basis for preparation of a post-PDR assessment to inform the MDA of technical risks and the program's readiness to proceed into detailed design. For ACAT IC and ACAT IAC programs, the Component Acquisition Executive will conduct the post-PDR assessment.

b. CDR. The CDR assesses design maturity, design build-to or code-to documentation, and remaining risks and establishes the initial product baseline. It will [illegible] that the system design is ready to begin developmental [illegible] software coding with acceptable risk. For MDAPs and MAIS prog[illegible] be conducted, assessing the conduct of the review and the technica[illegible] the MDA. For ACAT ID and IAM programs, DASD(SE) will conduct the CDR assessment. For ACAT IC and IAC programs, the Component Acquisition Executive will conduct the CDR assessment. This will be accomplished through DASD(SE) participation in the CDR and review of any program artifacts necessary to conduct the assessment.

87 ENCLOSURE 3

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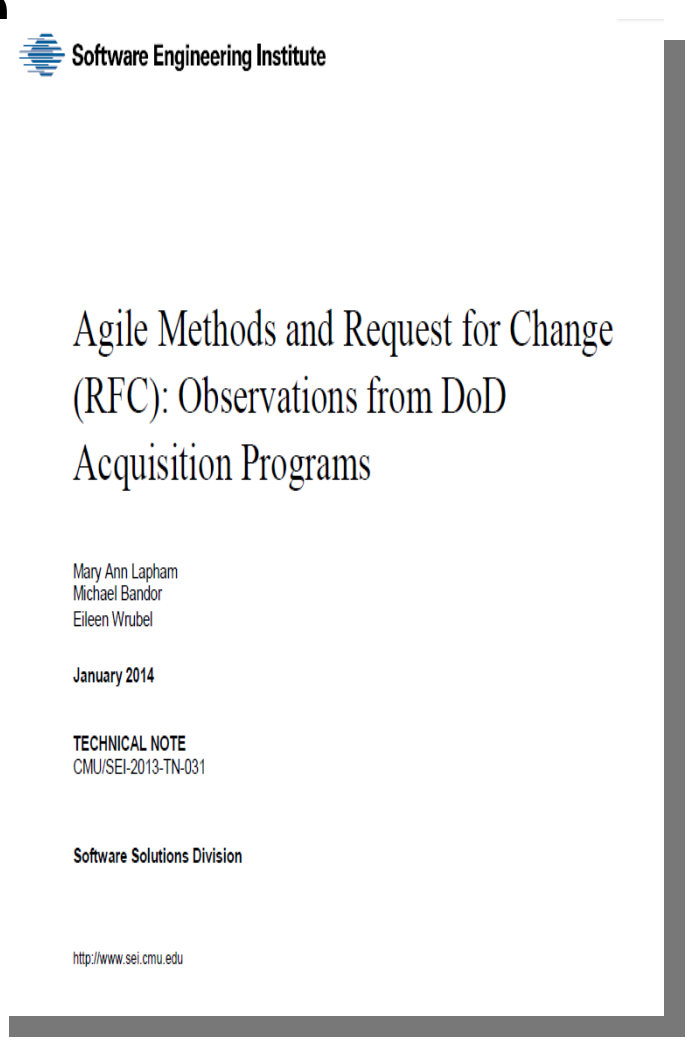
SEI Found 3 Patterns in Agile Settings for PDR, CDR Design/Execution



*PPDW=Partial Preliminary Design Walkthrough;
PCDW=Partial Critical Design Walkthrough

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PDR, CDR Pattern A

Advantages:

- Fits the more traditional acquisition life cycle
- Minimizes personnel travel costs

Disadvantages:

- Less synchronicity between development life cycle and review life cycle. CDRs and PDRs (per block) may be accomplished well into the iteration cycle raising the distinct possibility of rework in the event there is a direction change (e.g., requirements, etc.)
- PDR and CDR events end up being very long (3-5 days possibly) as information on each iteration will most likely be presented
- Decreases the in-process communication between the contractors and PMO regarding development efforts

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PDR, CDR Pattern C

Advantages:

- Potentially shortens the CDR to a high-level review (summarization of development efforts and outstanding action items)
- Allows for earlier looks at the evolving products by program office staff and end users and their surrogates
- Allows for direction change if needed much earlier in the delivery cycle of the increment
- Allows for better communication between contractors and PMO regarding development efforts
- Aligned well with the DAG incremental guidance
- Potentially increased synchronicity between development life cycle and review life cycle.

Disadvantages:

- Requires more travel and resource allocation for review activities by PMO personnel
- Requires increased communications by technical staff due to conveying interim review results to PMO management personnel.

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PDR, CDR Pattern C- Impact

- Additional communications required to ensure effective information flow from technical staff to PMO personnel.
- Communication must accurately present results and corresponding context for each iterative review.
  - Further, non-verbal aspects of the iterative review as well as management level nuances can be difficult to capture in prose.

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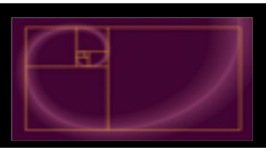

Subtopic 5: Progress Measurement

- Understanding the tools used to provide program insight in an Agile program.
  - Team Level Measure
    - Team productivity should not be used against the team
    - Do not compare one team against another
    - Identify various measures and how they are used
      - Velocity
      - others
  - Program Level Measure
    - EV Analyst (Agile platinum card) (Lockheed EVM tool that is widely distributed)
    - Cumulative flow diagram (lean engineering world) – lifecycle, time, bottlenecks, state transitions
    - % of user story point completion (aggregate across teams)
- Measuring work migration from one increment to another
- Understanding Technical Debt
  - Summarize
    - Intentional (strategic & tactical), Unintentional
  - Managing technical debt
    - The good and the bad
    - Effects on Velocity

Subtopic 5: Progress Measurement

- Index of Major Takeaways/Assessment Suggestions

- MT-Agile progress measurement can be adapted to comply with government Earned Value Management Systems.
    - True/False: EVM has been used both successfully and unsuccessfully in Agile contracted environment. (True)
- LP – When used productively, Agile enables situational awareness across stakeholders and provide the ability to accurately measure and forecast performance (ELO 4,5)
    - Multiple choice: If EVM work packages/cost accounts are managed below the release level in an Agile environment, what are some likely consequences? (choose all that apply)
        - EVM system has to be updated so frequently that it may take as much as an entire staff equivalent to keep up (correct)
        - Software developers may be asked to reprioritize work inside of an iteration, which is not a recommended practice. (correct)
        - Engineers and managers will finally have the data they have always needed to make real time decisions about the work (not correct)
- MT - Stakeholders should be aware of the impacts of technical debt and the migration of work in an Agile environment (ELO 4,5)
    - T/F: Any migration of work from one iteration to another in an Agile setting is bad. (False)
- MT – Like all programs, Objective technical completion criteria are essential for evaluating progress and performance regardless of the level at which the measurement occurs (ELO 5)
    - Multiple choice: Agile has two explicit concepts related to providing objective technical completion criteria for software. They are (choose only two):
        - retrospective
        - definition of done (correct)
        - technical debt
        - acceptance criteria (correct)
    - Multiple choice: Amount of Work in Process and Cycle time can both be discerned from which measurement visualization?
        - velocity chart
        - burn up chart
        - burn down chart
        - cumulative flow diagram (sand chart) (correct)

Sample Regulatory References

USAF Software Core Metrics	Army Regulation (AR) 70-1 Army Acquisition Policy
Software size Software development effort Software development schedule Software defects Software requirements definition and stability Software development staffing Software progress (design, code and testing) Computer resource utilization	Section 7-13 Software Metrics: PMs will negotiate a set of software metrics with the software developer to affect the necessary discipline in the software development process and to assess the maturity of the software product. At a minimum, the metrics should address— • Schedule and progress regarding work completion. • Growth and stability regarding delivery of the required capability. • Funding and personnel resources regarding the work to be performed. • Product quality regarding delivered products to meet the user's need without failure, as reflected in associated requirements documents. • Software development performance regarding the capabilities to meet documented program requirements. • Technical adequacy regarding software reuse, programming languages, and use of standard data elements.

Reference: United States Air Force. *United States Air Force Weapon Systems Software Management Guidebook, Version 1 (Abridged)*. 2008.

Reference: United States Army. *Army Regulation (AR) 70-1 Army Acquisition Policy*, Sections 7-12 and 7-13. 2011.

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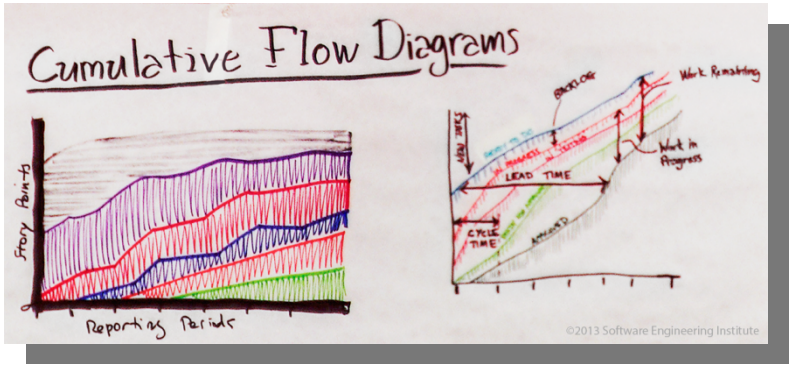
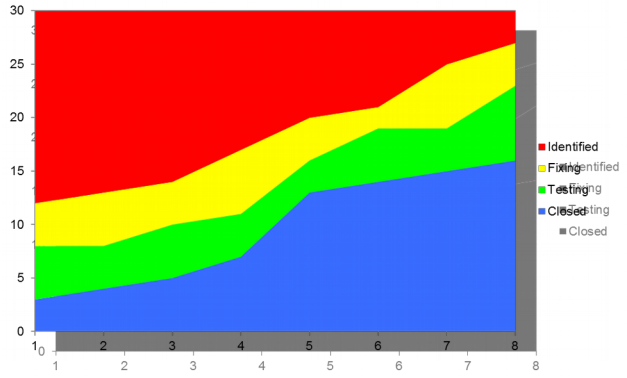
A Useful Display for Multiple Situations

Cumulative Flow Diagrams

- becoming popular with Agilists
- Useful in situations where want to understand patterns of work in transition across states
- Example uses defect measurement - most will use progress of work through defined states (predefined per program)





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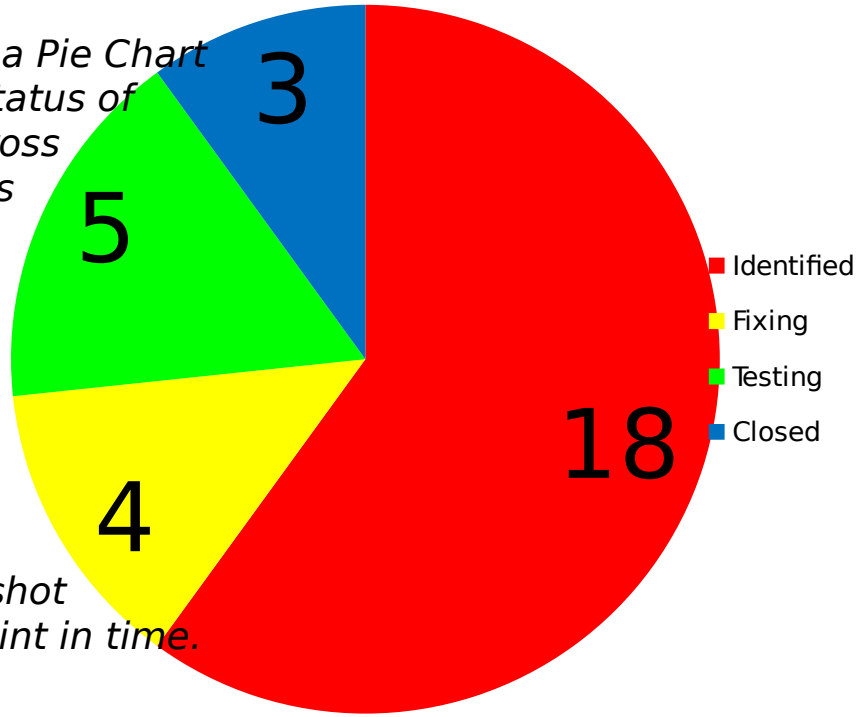
Suggested Content: Cumulative Flow Diagrams Construction

- Suggest that the following slides be constructed into an animation showing how you go from the first visualization to the last. (let SuZ Miller know if you need the Excel spreadsheet that contains the source data)

Constructing a Cumulative Flow Diagram-1

Here we have a Pie Chart showing the status of 30 defects across the four stages of the defect handling life-cycle.



This is a snapshot for a single point in time.

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Constructing a Cumulative Flow Diagram-2

Same data, but presented in a stacked column chart

For a single point in time.

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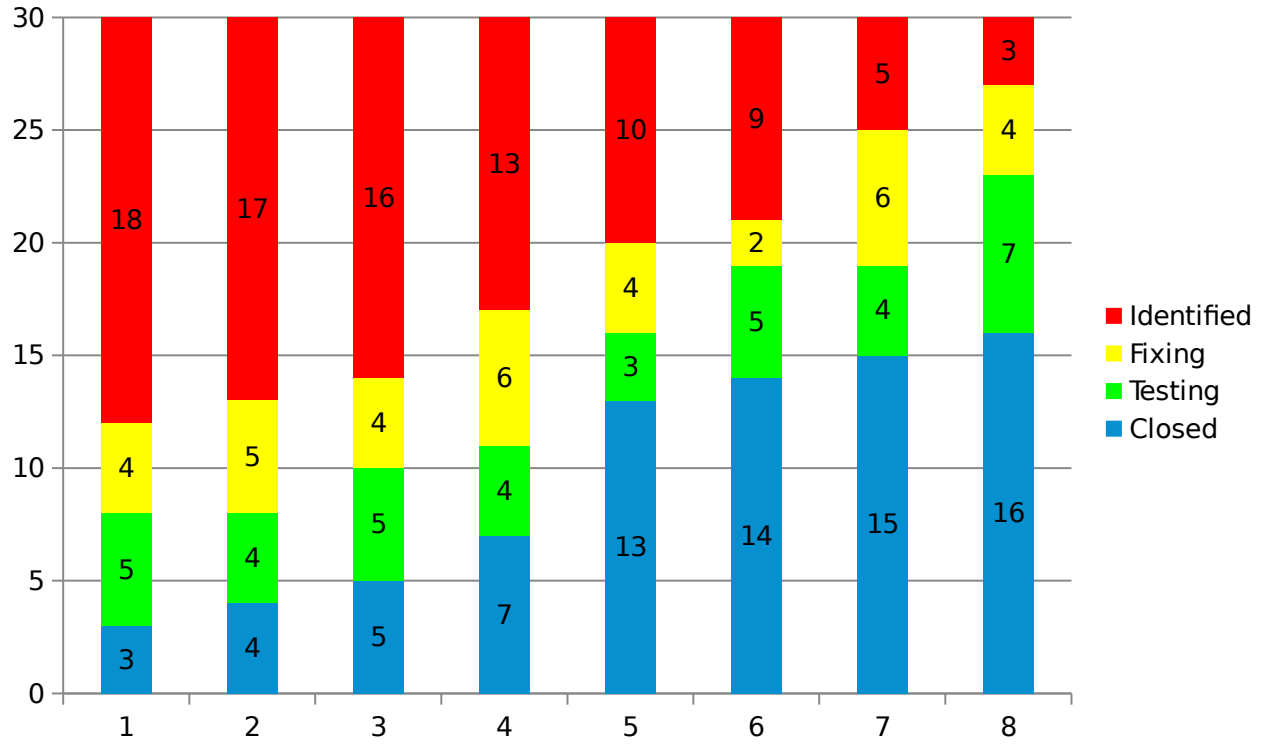
Constructing a Cumulative Flow Diagram$_3$

... adding the next 7 times



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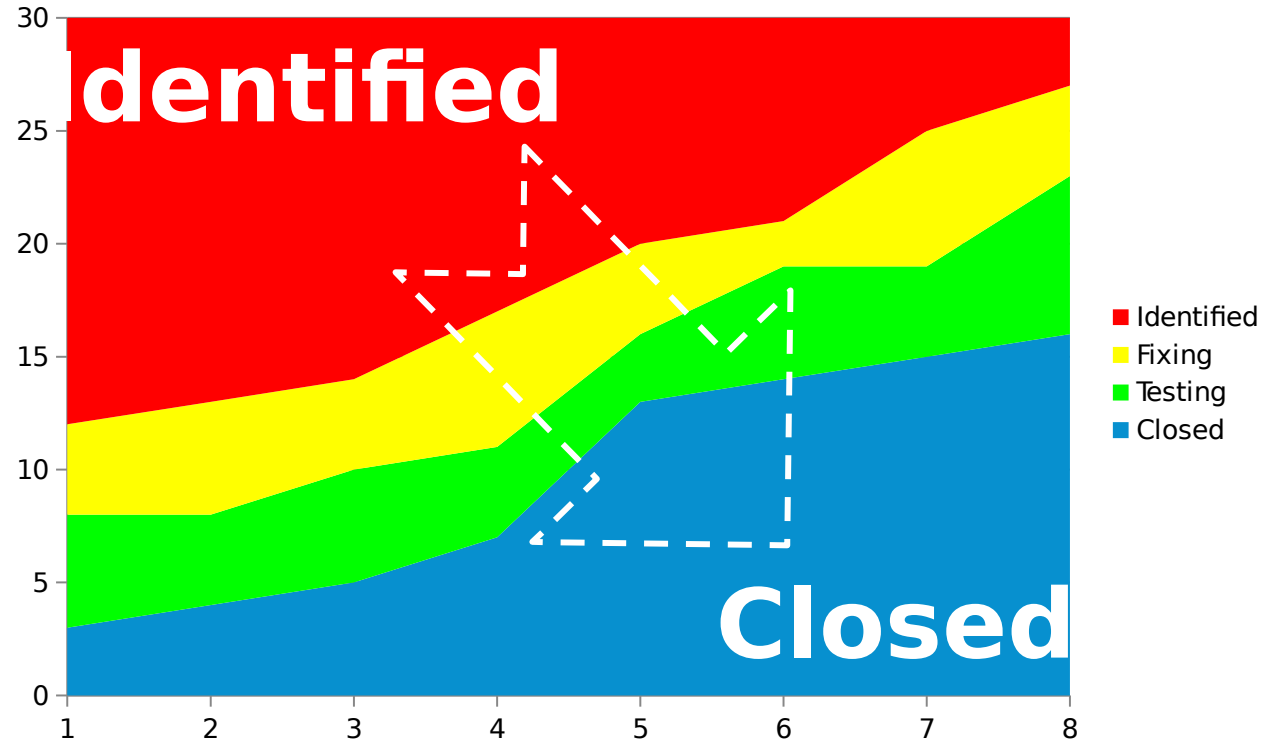
Constructing a Cumulative Flow Diagram$_4$

… now we are looking at the flow from "identified"… to "Closed"…
This view starts to show patterns a little easier…



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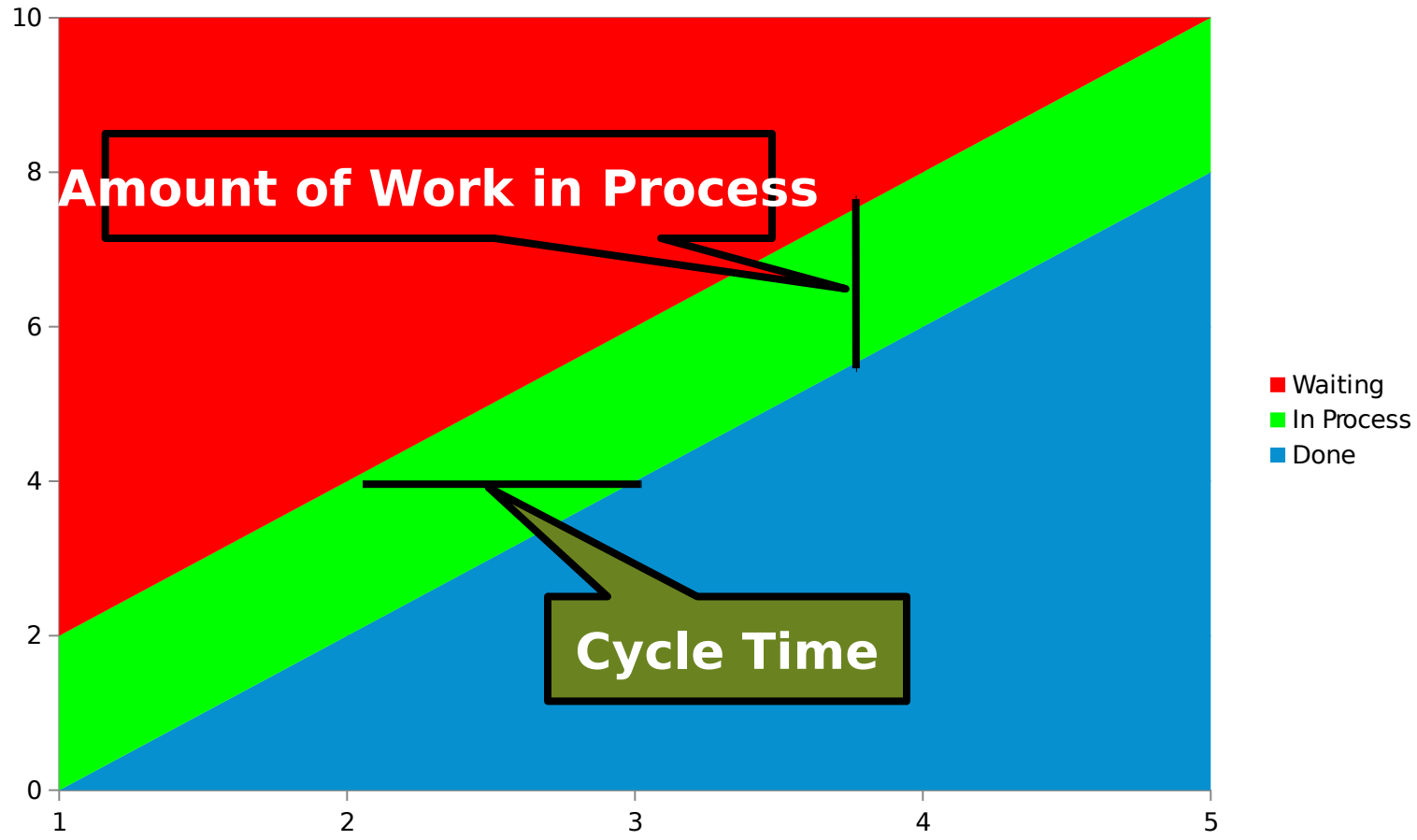
End of slides for animation

Tell-Tale Signals



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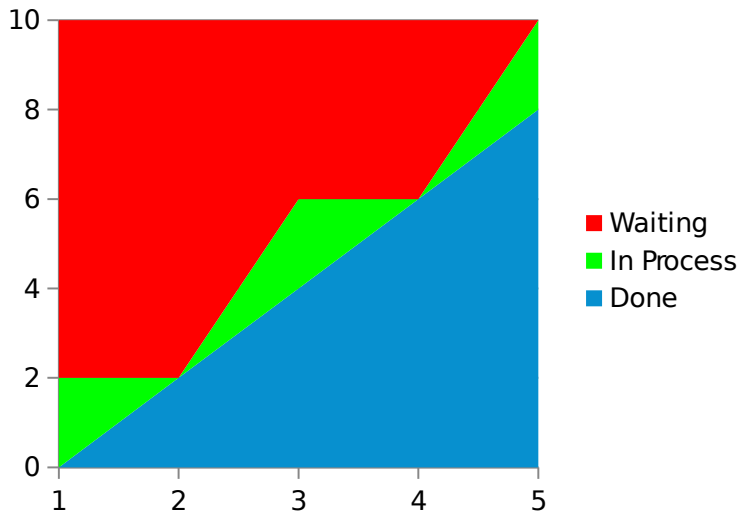
Assessment Exercise or Video Discussion Using Graphics

- In addition to the normal assessment questions, the following graphical questions could be used as “extra credit” or “test your depth of understanding” kinds of questions

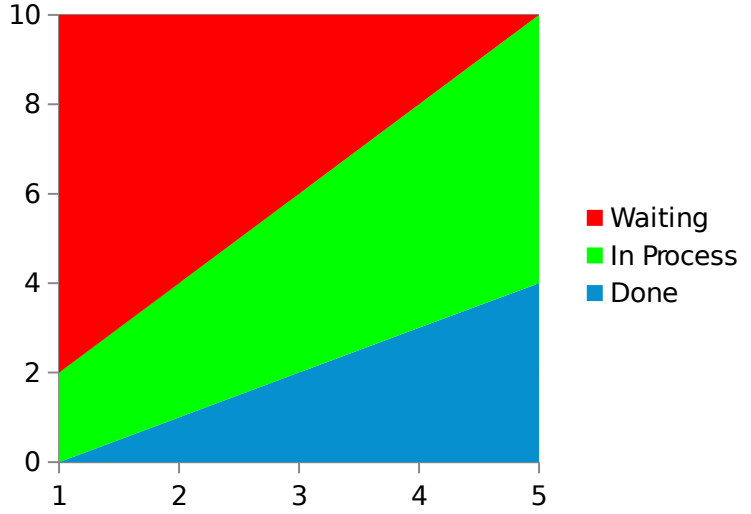
- Another possibility would be to use this segment as a “talking heads” video with SuZ Miller explaining the charts and what they might mean, with the “answer” charts presented during or after the discussion.

Multiple Choice: What Might Be Going on Here?

Question 1



Question 2



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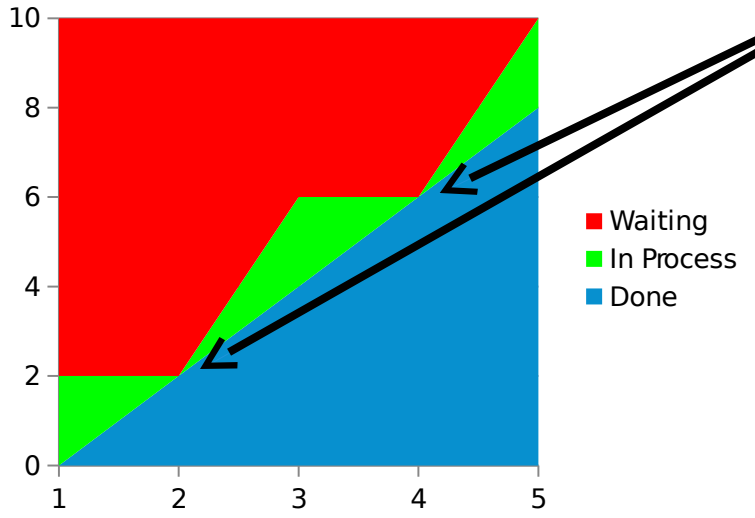
School Solution 1: What *MIGHT BE* Happening$_1$



At time 2, and then again at time 4, the number of items "In Process" goes to zero.

- **Have we lost the resource(s) that were preparing the items in the "Waiting" state?**
- **Is this intentional, due to limited resource(s) who can work on items in the "In Process" state?**

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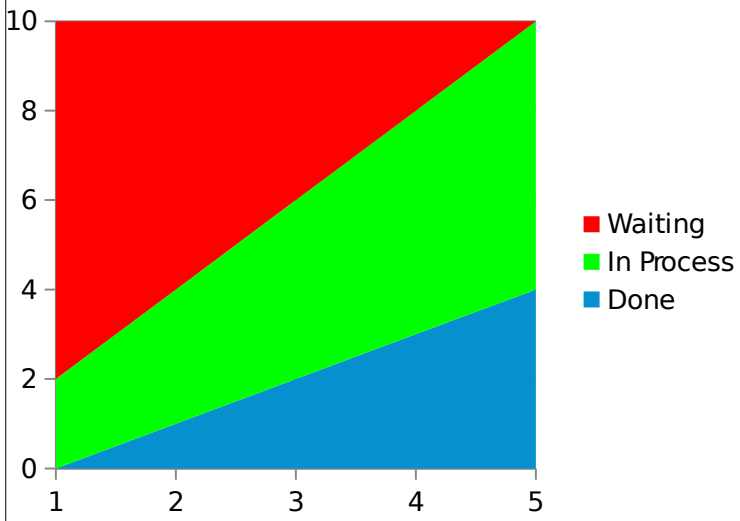
School Solution 2: What *MIGHT BE* Happening$_2$

The number of items that are "In Process" is growing over time.

- **The rate at which things enter "In Process" is greater than the rate at which things leave "In Process."**
- **Are people moving onto new items without completing their work?**
- **Are new resources being added, who start new work at each time period?**
- **Are things moving into the "Done" state quickly enough?**



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